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of the  
SARL



## Antique Wireless Association of Southern Africa

### Inside this issue:

CW Net	2
SSB Activity	2
AM	2
James Stanley Hey	3-6
Valve Socket Converter	7
AWA Open Day 2009	8
Notices	9

### AWA Committee:

- \* President—Rad ZS6RAD
- \* Technical—Don ZS5DR
- \* Net Controller—Willem ZS6ALL
- \* Newsletter/PRO—Andy ZS6ADY

# AWA Newsletter

#47

November 2009

## Reflections:

One of the best things about Amateur Radio are the friends that we make and the way it tends to draw people from such diverse backgrounds together.

I have met a lot of the people that I have listed in my logbook and have enjoyed the company of each and every one of them. In fact some of them I met before I even had the opportunity to chat on air with them.

A few of them, I have developed long distance relationships with, thanks to the Internet, yet it was through Amateur Radio that I met them.

Sometimes I get despondent about the way we treat one another and want to say "Well that's it, I'm outa here". But it doesn't take long before

I'm back there rag chewing call with the best of them.

Sometimes I get frustrated with those guys who take forever to pass on the baton especially when there are a few of us in a net. Then when it's my turn, I can also "waffle on", and when I'm finished, I wonder whose frustrated with me.

Sometimes I hear someone calling CQ and think to myself, "I don't really want to chat with that guy". Then I go back to him and end up having a great QSO and find out we actually have quite a lot in common.

Sometimes I tune through the band and think to myself, "Where are all the hams in SA. Nobody ever on frequency". Then when I call CQ we end up with a whole bunch of us having a pile up on local frequencies. All it took was a simple

Sometimes I get myself in a tizz because I have problem with one of my rigs and I can't sort it out myself. Then when I chat to someone about it they say "Bring it around and lets have a look at it together. Maybe we can find the fault". Then I become even more convinced this is a great hobby we are in.

Lets face it, Radio Hams are a different breed of people. Friendly, strong characters, easily distracted. Helpful, able, technical junkies who have probably all been over exposed to large amounts of RF and high voltage.

If your eyes don't glow in the dark, then you ain't been talking on your radio enough

Best 73

De Andy ZS6ADY

## Wikipedia—The Resistor

A **resistor** is a two-terminal electronic component that produces a voltage across its terminals that is proportional to the electric current through it in accordance with Ohm's law:  $V = IR$

Resistors are elements of electrical networks and electronic circuits and are ubiquitous in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of a high-resistivity alloy, such as nickel/chrome).

The primary characteristics of a resistor are the resistance, the tolerance, maximum working voltage and the power rating. Other characteristics include temperature coefficient, noise, and inductance. Less well-known is critical resistance, the value below which power dissipation limits the maximum permitted current flow, and above which the limit is applied voltage. Critical resistance depends upon the materials constituting the resistor as well as its physical dimensions; it's determined by design.

Resistors can be integrated into hybrid and printed circuits, as well as integrated circuits. Size, and position of leads (or terminals) are relevant to equipment designers; resistors must be physically large enough not to overheat when dissipating their power.

## CW Net:

We have certainly had a few surprises during this last month with 40m giving us a few treats.

So far this month we have heard John ZS6JBJ from Witbank 599, which has been an absolute pleasure to QSO with John again after a long time of really poor propagation. John uses a straight key on the net. Also heard was John ZS5JON from Durban with his familiar bug 599. Clive from Muldersdrift 599. Lets hope this is the beginning of a beautiful relationship with 40m and a new beginning for all those frustrated with the bands.

Let me not forget of course the old stalwarts Barry ZS6AJY and Pierre ZS6BB, who are always there.

Om Dave ZS6AAW has been sending me the odd copy of Roger Cooke's Morse

Mode section from Practical Wireless and I must say I find it quite enjoyable reading. Thanks Dave.

In the most recent copy he sent me there was reference to a web address of some old 78 records which were used for training in the US army and I found it quite interesting to go and listen to some of the recordings, which are fairly good quality, considering they were made in the 1940's.

For those with a nostalgic interest, the site is as follows : [www.archive.org/details/U.S.\\_Armed\\_Forces\\_Institute\\_Basic\\_Radio\\_Code\\_ca1942](http://www.archive.org/details/U.S._Armed_Forces_Institute_Basic_Radio_Code_ca1942)

Here's hoping the change in band conditions is going to hold out and that from now on it can only get better. Also to the day when we will be able to hear the div 1 stations on 40 again.



Monarch KY 102

So keep your ears tuned and the fingers in good trim for the day when we can all get together and enjoy a good CW QSO again on 40m.

De ZS0AWA/CW ....-

## SSB activity:

As good as what the bands have been for CW, they have been almost the opposite for the SSB net in the mornings.

Even 80m is getting more difficult to operate the further stations on as the D layer absorption takes place a lot earlier now.

Yet we continue along unabated. The call in rate has not dropped under 15 every week and I suppose we can still consider that fairly good.

From the logs received for the SSB section of the Valve QSO Party, there were 99 stations taking part from only 5 logs received. Which goes to show, conditions were not

that bad on the afternoon session.

If you haven't sent in your log yet, get it off to me. You still have until the 31st to get it either in the mail or in by email.

There has been a fair amount of activity both on 40 and 80m recently and all you have to do is listen around the bands to hear what's happening. The bands are definitely starting to pick up now and lets hope it's going to bring back all those who have taken a break with the poor conditions.

Quite a few contests have taken place locally as well as Dx and 40m has even proved to be quite effective during the late evenings with

a good few Dx contacts still being made.

Lets not give up hope just yet.



Collins KWM2-A

## AM:

The AM nets still seem to be rolling along at the same speed. The Saturday morning net still being the most popular for call in's.

The Wednesday evening net has all but disintegrated due to the summer storms bringing a high level of QRN in the late afternoons and evenings.

The Friday afternoon net has it's day's but quite often will produce medium results in the we can hear div 5 and the local stations quite well. Once again, this is dependant on the level of QRN being produced.

The AM leg of the QSO party also produced some good results with 54 participants taking

part and quite a few of them on all valve rigs. The majority seem to be divided up amongst the hybrids (FT101's) and some all transistor rigs.

I still think if we can get 54 people coming up on AM in an afternoon, then we are not doing too badly and there is still quite an interest out there. This of course encourages people to get some old valve rigs restored and running for the next QSO party and so we achieve what we have set out to do. The maintenance and restoration of our amateur radio heritage.

To those who are busy with restoration projects, keep them going and we look forward

to hearing many more valve rigs on the air. We may have some exciting offers planned for next year to try and encourage the use of AM, but that will be further down the line

Keep those valves glowing and enjoy your hobby.



RACAL RA17L Rx

## James Stanley Hey

### The mystery of Sun noise answered

James Stanley Hey was a civilian scientist who was the head of a specialist team at the British Army Operational Research Group (AORG) during World War 2. His discovery of solar radio noise finally confirmed the Sun was a powerful radiator of electromagnetic waves. However, Hey was not working on this subject, he happened upon it by accident. Not only did Hey and his team make this breakthrough but later other extremely important discoveries.

#### **This is the story.**

Hey was born in the Lake District in 1909 and studied physics at Manchester graduating in 1930, and obtained his master's degree in X-ray crystallography the next year. He was then a teacher of physics in a northern grammar school for some years. The Second World War began in 1939, and in 1940 Hey joined the Army Operational Research Group (AORG) after a 6-week course at the Army Radio School by J A Ratcliffe. (Ratcliffe, a Cambridge radio physicist, Fellow of the Royal Society, later became the Director of the Radio and Space Research Station, Slough).

From 1940 to 1952 Hey was on the staff of the Army Operational Research Group. He then became a research scientist at the Royal Radar Establishment. Hey and his team were civilians scientists working with the army personnel using the new VHF gun laying radar to detect enemy aircraft. The team consisted of many disciplines in electrical and mechanical engineering as well as theoretical sciences. There were many teething problems with these new radar systems and Hey and his colleagues were kept very busy investigating and suggesting modifications that would solve the problems. These radar systems were attached to anti-aircraft gun batteries probing the night sky for intruders. Many of these radar systems were situated near the coast to provide an early warning of approaching bombers and night fighters.

On the mornings of February 27 and 28 1942 Hey was alerted to a strange thing that was happening to the radar systems. Hey received many reports of suspected jamming, making the radar unusable. This was not something new; Hey had experienced persistent barrage jamming by the Germans before. On 12 February 1942 the German jamming stations in France had blinded the entire allied radar systems allowing the two warships Scharnhorst and Gneisenau to slip out of Brest harbour just before dawn and make the dash for home. The Royal Navy had kept these two warships pinned down in the harbour for over 4 months by patrols. On the day they escaped there was an early morning thick fog making visual contact impossible. This jamming meant that their passage through the English Channel went unnoticed until it was too late to stop them. Following this event the British began to look at electronic counter measures in great detail to limit the effect of jamming to its radar systems. Hey and his teams expertise was called upon to formulate improved reporting systems and instructions to operating personnel how to deal with the jamming.

*Dr R V Jones of RAF intelligence in his book "Most Secret War" described one such jamming incident, which put out of action the whole of the East Coast stations. When asked to advise on what to do, as the radars had been turned off as they were useless, Jones after some thought told the radar personnel to keep them running as if nothing was wrong. The Germans in a few days gave up on the jamming as it thought the allied radar was immune to their jamming.*

This time the jamming wasn't spot frequency or barrage jamming, it mattered little which frequency the radar was set to, the jamming was all across the band. Not only was the noise level high it also increased in short bursts from time to time. The radar was the GL2 MKII and operated between 55 and 75MHz on 11 preset channels. The GL2 MKII was a further development of the pre war GL MK1 Star developed by the British Army. Because of the urgency of developing the Chain Home aircraft detection radar this version of the GL series of radars were delayed in development until the start of the war. The GL2 MKII was a radar running 150kW and a range of 30km with a crude height finding capability. The height finding was improved by an engineer from Cossor (the manufacturer) by the name of Bedford by the inclusion of an extra dipole array mounted above the main array, affectionately known as

#### **"The Bedford Bastard".**

The GL2 MKII had horizontally polarised dipole arrays pointed at the horizon towards the European mainland, which basically is due east. Hey called for more detailed reports and beam headings where the jamming was strongest. When he had this information he noticed something odd. All the reports showed the antenna was beamed on a certain heading, no matter where the radar was situated and appeared to follow the Sun. If it was a jamming station

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then from Scotland to the South Coast the headings should be different, but they were all slightly south of east. Further interrogation gave a clue. Before sunrise the jamming wasn't heard and it started to fade out at about noon and disappeared late in the afternoon. Hey had a hunch. He telephoned Greenwich Royal Observatory and enquired if anything odd was occurring with the Sun. "Indeed there is" was the reply from an excited astronomer "There are a large group of sun spots on the central limb and very large solar flares, but what made you enquire?" Hey had to decline to answer the question on account of national security and fobbed the enquiry off as best he could.

Finally, the penny dropped and Hey vaguely remembered during his studies for his B Sc. degree in physics reading about Professor Oliver Lodge's attempt in Liverpool to receive long wavelength electromagnetic radiation from the Sun in 1897. He hurried to the Imperial College in London and found a copy of Lodge's reports on the experiment. This is what Lodge had to say:

"I did not succeed in this, for a sensitive coherer in an outside shed unprotected by the thick walls of a substantial building cannot be quiet for long. I found the spot of light liable to frequent weak and occasionally violent excursions, and I could not trace any of these to the influence of the Sun. There were evidently too many terrestrial sources of disturbance in a city like Liverpool to make the experiment feasible" (The spot of light refers to Lodge's mirror galvanometer).

Hey had accidentally proven what the scientific world had been arguing about for nearly 50 years, was the Sun a generator of electromagnetic waves, as Maxwell's equations suggested, and Lodge was convinced about but unable to prove.

Hey wrote a report on his finding and presented it to his director B F J Schonland for comment. Brigadier Schonland (later Sir Basil Schonland) was the South African professor from Wits University seconded to the AORG as the Director. Schonland recalled Karl Jansky's work in the USA in the early 1930s where he had detected strong radio signals from deep space at 20MHz. Hey hadn't heard of this before Schonland mentioned it. Schonland explained:

"The Sun is no different to stars, which are after all are just much bigger versions of our Sun, but much further away".

Hey deduced that the powerful emissions were due to the intense magnetic field within the Sun and the ejection of streams of ions and electrons generated electromagnetic radiation in the same manner as the cavity magnetron oscillator. However, when the same question was posed to several very eminent scientists in Britain most rejected the idea as impossible. They found it hard to believe that such powerful outbursts of radio waves had escaped the attention of researchers working on propagation in the ionosphere over several decades. It was apparently inconceivable to them that a mere "amateur" in the field should be presenting a paper on this complex subject.

This report and any knowledge of it was suppressed for the duration of the war as it showed a severe weakness in the VHF radar systems, which the allies did not want the enemy to find out about. By coincidence across the Atlantic in the USA a scientist working on centimetric radar receivers, G C Southworth at Bell Telephone Labs, independently came to the same conclusion almost a year earlier. Southworth's receiver operated in the 3.2cm band (9GHz) and as soon as it was working a colleague requested him to point the parabolic antenna at the Sun, which was a perfectly normal thing to do to check the focussing of the antenna. This colleague was A P King and Southworth did just this on 29 June 1941. There was a small but definite increase in receiver noise when the antenna was swung across the Sun. From the noise level received Southworth was able to calculate the "black-body" temperature of the Sun. He found that rather than the expected 6,000 K as calculated by Planck's Law, and supported by optical measurements, it was 20,000 K and the chromosphere was responsible for the radiation generated. Southworth completed his measurements and wrote his paper in the latter part of 1942, after Hey had written his report.

Why was Hey unaware of Southworth's findings? This was wartime and the publishing of scientific papers were stopped at the outbreak of war so the enemy could not gain scientific knowledge of the allies. Another factor is that Southworth was working in the microwave region whereas Hey's findings concerned low VHF bands, so they were hardly likely to be associated at first glance, except by someone with an intimate knowledge of the subject. Hey's report and his subsequent paper were only allowed to be released for publication in January 1946, after the war had finished. At about the same time Southworth also published his 1942 paper in early 1946 in the USA, but it was several years until the significance was noted and the two papers associated. So began a new branch of radio astronomy, which flourished rapidly.

But Hey's accomplishments were not finished, far from it.

During the latter part of the war Hitler's Germany started to unleash some new terrifying weapons in a desperate attempt to break Britain's resolve. The first was a pilot-less flying bomb, which the allies called the V1. Dr Jones at RAF Intelligence through decrypted German Enigma messages had early warning of the threat and followed the de-

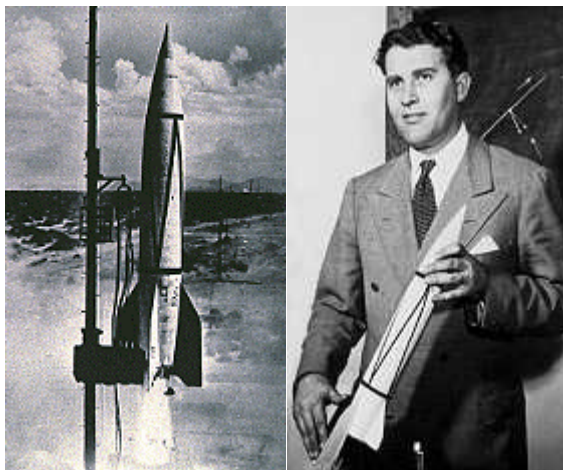


velopment closely until it was finally deployed in early 1944. Hey and his team were asked to counter this new threat in any way possible. Hey and his team were stretched to the limit and only had the old VHF GL2 MKII to fall back on. Hey quickly devised a new and better antenna system to replace the dipole array (developed from WatsonWatt's Lorenz beam system) and fitted a number of radar systems with 4-element Yagis which increased the range by over 100%. These still pointed to the horizon and gave good early warning of the high-speed missiles.

*Interestingly the Germans, although aware of the Yagi antenna, and Japan was at the time an ally with Germany, believed that this was a non-starter for radar antenna until they discovered that the allies had used them on the Searchlight Control Radar (SLC) operating on about 200MHz. The early allied AI (airborne Intercept) radar on about 220MHz also used large Yagi arrays with great success.*

### Dummy V2 missile for training at Peenemunde.

Later the V2 was thrown into the attack, just after the June 1944 D-Day landings in Normandy. The V2 was a 10,8 ton ballistic missile carrying 0,9 ton of explosive, about the same as the V1, which weighed a little over 1,5 ton. Hitler had been warned the V2 missiles were still not adequately developed, but he had no choice, it was the last throw of the dice. The V1 could be caught and shot down by faster fighter aircraft or by anti-aircraft guns. The V2 had little possibility of being shot down, although this didn't deter the anti-aircraft gunners from trying, and a reported handful actually were shot down using the new microwave radar guided guns supplied by the USA just before the last launching sites were captured by the allied troops. The V2 rose to an altitude of 100km in a parabolic trajectory and then with the fuel expended fell under gravity towards the target area. It had a range of 320km. Under free fall it attained a speed of 5-times the speed of sound. The best that could be done was to detect it as it rose and give a few minutes warning of the likely target area. Hitler had initially decided that London was the prime target, although more actually fell on Antwerp, Belgium than England, as a retaliatory vengeance move for the Belgium resistance against the Germans.



German V2 (A4) missile and Wernher von Braun its inventor

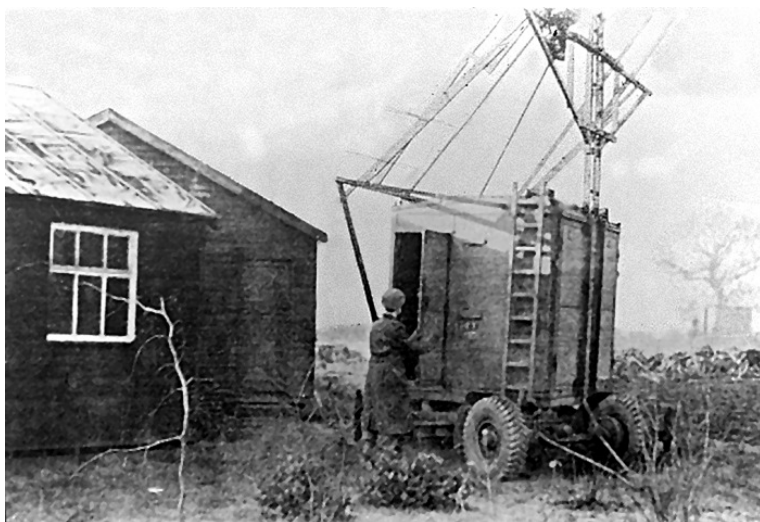
Hey had no time to devise new apparatus and made a hasty decision. He modified the V1 radar by the simple method of tilting the Yagi array up at an angle of 60-degrees. This could just detect the V2 at the peak of its trajectory at a range of 200km. Fifty of the standard V1 GL2 MKII systems were modified in the space of 2 weeks and a new lower noise prototype front end for the receiver was

cobbled together to improve the sensitivity and hence the range. Surprisingly, the better receiver made no significant difference and it was only after another scientist (J M C Scott) pointed out that the sky noise at about 70MHz was high that Hey realised why the range was not improved. (Scott was a lecturer of physics at Cambridge University).

The V2 radar system suffered from many false alarms but no V2s appeared at the time. On average during the night 5 to 10 false echoes per hour were recorded

and were a persistent nuisance to the operators. Hey and his team over a period connected these false echoes with meteors entering the atmosphere and burning up at about 100km altitude. Conclusive proof came after the V2 launching sites had all been captured, but the false echoes still occurred even without the V2s. This was a completely new and unknown type of interference, although Hey was later to learn that Skellett, Schafer and Goodall in the USA in 1932 had demonstrated the formation of ionisation trails by meteors.

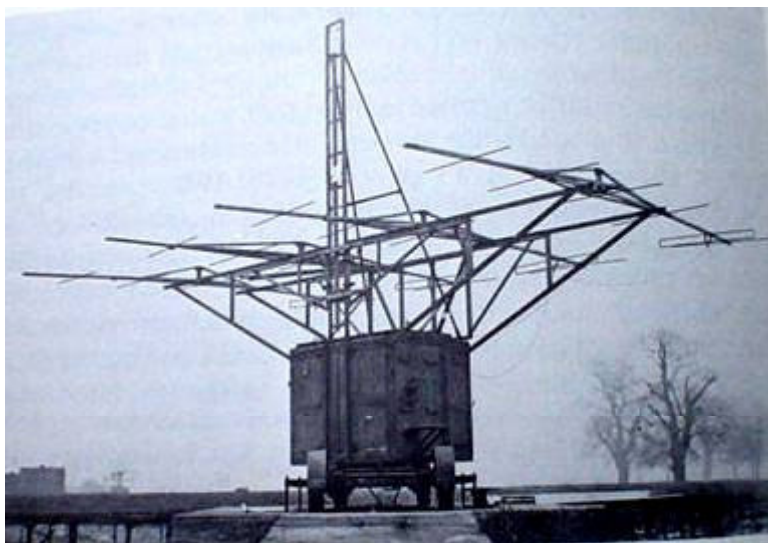
As the war finally came to a close Hey and his team had little work to do and he suggested it would be a good time to concentrate on some of the still unexplained problems encountered, especially the meteors. This was because the team would likely soon be disbanded allowing the members to return to civilian work. Hey arranged for three GL2 radar systems, separated by a considerable distance, to point to the same point in the sky and record the time when the echoes were acquired, strongest and ceased. Two of these were in-service anti-aircraft radar situated at



British Army AA No.1 MKII (GL2) Radar at Jodrell Bank, December 1945 (V2 detection RADAR)

Aldeburgh, East Anglia and the other at Walmer, Kent, the third being at AORG HQ at Richmond Park, London. He found that first one and then another and finally the third radar acquired the echoes and then lost them but they were never received simultaneously by all the sites but spaced in time over several hours. The reason for the difference in time was due to the rotation of the Earth. From this Hey deduced the ionisation caused by the meteors was a long and thin ionised trail and gave maximum echo response when the radar beam was at right angles to the ionised trail. During the long period of studying the meteor trails it was evident that the hourly count varied considerably, on an average night some 20 per hour would be counted and a few days or weeks later many hundreds per hour. Hey had discovered meteor showers, as had the optical observers some years earlier. Hey also later discovered "day-time" meteor showers which up to this time had only been observed visually at night.

Hey also assisted Dr Bernard Lovell at Manchester University (later at Jodrell Bank Observatory) with the loan of a V2 radar system for studies of cosmic ray particles. But as Hey expected it was unlikely that low frequency radar would be successful and Lovell soon gave this up when he discovered, as Hey had done, the meteors and went on to work on this subject for several years.



Antenna at AORG HQ used by Hey to detect Cygnus A

After the war finished Hey and a small part of the team stayed on at AORG HQ to conduct more experiments.

The team now consisted of Hey, Parsons, Phillips and Stewart. In one experiment in 1946 Hey used the receiver portion of the GL2 MKII radar with four 5element

Yagis pointed at the horizon. Using this they detected the Cygnus-A constellation and confirmed Jansky's earlier measurement of extra-terrestrial objects. A little time later in 1952 Hey and his team broke up, Hey leaving to join the Royal Radar Establishment at Malvern and the others to take up similar posts elsewhere, and so the AORG GL2 MKII V2 radar was passed to Lovell for his use.

Hey published his book "The Radio Universe" in 1971 and "The Evolution of Radio Astronomy" in 1973. Both are still in print. Amongst his awards were the MBE, Fellow and Member of the Royal

Astronomical Society, Fellow of the Royal Society. Hey died in 2000 at the age of 91.

(Thanks to John ZS5JF for this article)



Hi Andy

Thanks for the newsletter. I especially enjoyed the articles on the battle of the beams. I recently got the urge to make something, and decided to make a valve socket converter for my QRP valve rig. It uses an 807 in the final, and I have had these tubes type 5B/254M for many years and thought one of them should be tried in the final. So I connected up an eight pin loctal socket to the base part of a smashed 807, plugged it in, and it worked first time. I asked around about these 5B/254M tubes, and Barrie said he thought they were used in the Friend or Foe rigs of WW2. So it is a bit of a coincidence that an article in the newsletter dealt with these rigs. I attach pics of the rig with the 5B/254M in place and also with the 807.

Cheers


Evert ZS6AQW



807



5B/254M



**ALWAYS  
BE  
CAREFUL**

★ ★ ★

(A) Kill all transmitter circuits completely before touching anything behind the panel.  
 (B) Never wear 'phones while working on the transmitter.  
 (C) Never pull test arcs from transmitter tank circuits.  
 (D) Don't shoot trouble in a transmitter when tired or sleepy.  
 (E) When working on the transmitter, avoid bodily contact with metal racks or frames, radiators, damp floors or other grounded objects.  
 (F) Keep one hand in your pocket.  
 (G) Develop your own safety technique. Take time to be careful.

★ ★ ★

***Death Is Permanent!***

Received this nice little picture from Tony ZR1TT. He says he cannot remember where he got it from, but it hangs on his shack wall. Pretty good reminder for those of us working with Antique rigs with "High Voltage".

## AWA Open Day at TAC

And so another Open Day has come and gone. Not very well attended this year at the TAC, but those who went had a pleasant time. There was the normal radio display with some wonderful examples of our Amateur Heritage, and some fine examples of Old Test Equipment.

The flea market proved to move quite a few items from one owner to another and of course the AWA table also brought in some donations towards the printing and mailing of the Newsletter.

At the AGM held after all the fun stuff, The following nominations were received for the AWA committee. President—Don Radford ZS5DR (unopposed), Technical Advisor—John Fielding ZS5JF; John Watson ZS6ABJ. PRO—Andy ZS6ADY.

Should you have any further nominations, please submit them to Rad ZS6RAD, before the 30th November. The constitution states all nominations for posts must be received by the 30th November, thereafter, if necessary, voting will take place.

Andy presented a brief outline of the financial status for the year and we are well in the black, thanks to all the donations we have received in both money, and equipment which has been sold off. This has helped to boost the coffers and enable us to send out this newsletter on a monthly basis to those who receive it by snail mail.



The Flea Market Tables attracted a good interested parties



Cliff ZS6BOX and Doug ZS6BXU catching up on old times



This fine old National was Donated to us by Berridge ZS6BFL



Yours Truly with a fine piece of Test Equipment we haven't quite identified yet. Donated by Doug ZS6BXU



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**Antique Wireless Association  
of Southern Africa**

**Mission Statement**

Our aim is to facilitate, generate and maintain an interest in the location, acquisition, repair and use of yester-days radio transmitters and receivers. To encourage all like minded amateurs to do the same thus ensuring the maintenance and preservation of our amateur heritage.

Membership of this group is free and by association.

## Notices:

**Last issue by Snail mail :**

I am afraid to say that this may well be the last issue that I will be able to send out in hard copy format.

The reason for this is as from January I will no longer be employed and it was due to the kind offer of my Employer that I was allowed to produce the hard copy on the company photo copy machine as long as we supplied our own paper, which is what happened with the funds that were collected through donations.

I will investigate the possibility of having the copies done at a copy shop, but I don't think it will be a viable proposition as this is not cheap. I will put forward a proposal to the committee concerning this, but due to there being no membership fee for the AWA, this may not be sustainable.

At present there are 30 people who receive the newsletter in hard copy format. If any of you have email facilities and are able to receive the newsletter by email, please let me know. Any one who has recently given me donations for the hard copy of the newsletter, I will return their donations in person.

I will continue to produce the AWA newsletter in electronic format.

My apologies to anyone who may feel inconvenienced by this, but it is due to circumstances beyond my control.

Best 73  
Andy ZS6ADY